

WHAT IS CLAIMED IS:

1. A header compression apparatus for compressing a header of a packet to be transmitted by referring to reference information that is also included in a receiving side, said apparatus comprising:

5           reference information management means for storing and managing said reference information;

            packet compression means for compressing the header of the packet in a specified operation mode by referring to said reference information, and selectively adding, to the compressed  
10          packet, update information for updating the reference information at the receiving side;

            packet transmission means for transmitting the packet compressed by said packet compression means;

            packet receiving means for receiving an ACK packet  
15          indicating that the reference information at the receiving side has been correctly updated or a NACK packet for requesting transmission of said update information due to a header decompression error that occurred at the receiving side; and

            mode determination means for switching the operation  
20          mode of said packet compression means to a reliable mode where, after the reference information of the header compression apparatus is updated, said packet compression means continuously adds said update information until the ACK packet is received,



apparatus comprising:

- 5           reference information management means for storing and  
managing said reference information;
- packet receiving means for receiving the packet with  
update information selectively added thereto for updating said  
reference information;
- 10          packet decompression means, provided with the packet  
received by said packet receiving means, for updating said  
reference information by using said update information, and  
decompressing the header of the packet by referring to said  
reference information;
- 15          packet transmission means for transmitting an ACK  
packet indicating that said reference information has been  
correctly updated or a NACK packet for requesting transmission  
of said update information when a header decompression error  
occurs in said packet decompression means;
- 20          mode determination means for switching the operation  
mode of the transmitting side to a reliable mode where, after  
updating the reference information of the transmitting side, the  
transmitting side continuously adds said update information until  
receiving the ACK packet, and to an optimistic mode where the
- 25          transmitting side adds said update information when the reference  
information of the transmitting side is updated and whenever  
receiving the NACK packet; and
- mode notification means for notifying the transmitting

side of said operation mode selected by said mode determination

30 means, wherein

said mode determination means counts the number of header decompression errors that occurred by a unit time  $X$  in said packet decompression means, and, when said operation mode is the optimistic mode and said number is larger than a predetermined value  $Y$ , said mode determination means switches said operation mode to the reliable mode, and when said operation mode is the reliable mode and said number is smaller than a predetermined value  $Z$ , said mode determination means switches said operation mode to the optimistic mode.

4. The header decompression apparatus according to claim 3, wherein

said mode determination means calculates a rate of change in said number by the unit time  $X$ , and increases the unit time  $X$  when said rate of change is smaller than a predetermined value  $A$ , and decreases the unit time  $X$  when said rate of change is larger than a predetermined value  $B$ .

5. A header compression apparatus for compressing a header of a packet to be transmitted by referring to reference information that is also included in a receiving side, said apparatus comprising:

reference information management means for storing and

managing said reference information;

packet compression means for compressing the header of the packet in a specified operation mode by referring to said reference information, and selectively adding, to the compressed  
10 packet, update information for updating the reference information at the receiving side;

packet transmission means for transmitting the packet compressed by said packet compression means;

packet receiving means for receiving an ACK packet  
15 indicating that the reference information at the receiving side has been correctly updated or a NACK packet for requesting transmission of said update information due to a header decompression error that occurred at the receiving side;

delay time measuring means for measuring a roundtrip  
20 delay time with respect to the receiving side by transmitting and receiving a packet to and from the receiving side; and

mode determination means for switching the operation mode of said packet compression means to a reliable mode where, after the reference information of the header compression  
25 apparatus is updated, said packet compression means continuously adds said update information until the ACK packet is received, and an optimistic mode where said packet compression means adds said update information when the reference information of the transmitting side is updated and whenever receiving the NACK  
30 packet, wherein

said mode determination means receives, by a unit time  $X$ , said roundtrip delay time from said delay time measuring means, and switches said operation mode to the reliable mode when said operation mode is the optimistic mode and said roundtrip delay time is smaller than a predetermined value  $Y$ , and to the optimistic mode when said operation mode is the reliable mode and said roundtrip delay time is larger than a predetermined value  $Z$ .

6. The header compression apparatus according to claim 5, wherein

said mode determination means calculates a rate of change in said roundtrip delay time, and increases the unit time  $X$  when said rate of change is smaller than a predetermined value  $A$ , and decreases the unit time  $X$  when said rate of change is larger than a predetermined value  $B$ .

7. A header decompression apparatus for decompressing a header of a received packet by referring to reference information that is also included in a transmitting side, said apparatus comprising:

5           reference information management means for storing and  
managing said reference information;

packet receiving means for receiving the packet with update information selectively added thereto for updating said reference information;



35 X, said roundtrip delay time from said delay time measuring means,  
and switches said operation mode to the reliable mode when said  
operation mode is the optimistic mode and said roundtrip delay  
time is smaller than a predetermined value Y, and to the optimistic  
mode when said operation mode is the reliable mode and said  
40 roundtrip delay time is larger than a predetermined value Z.

8. The header decompression apparatus according to  
claim 7, wherein

said mode determination means calculates a rate of  
change in said roundtrip delay time measured by the unit time X,  
5 and increases the unit time X when said rate of change is smaller  
than a predetermined value A, and decreases the unit time X when  
said rate of change is larger than a predetermined value B.

9. A header compression method of compressing a header  
of a packet to be transmitted by referring to reference  
information that is also included in a receiving side, said method  
comprising:

5 a packet compression step of compressing the header of  
the packet in a specified operation mode by referring to said  
reference information stored, and selectively adding, to the  
compressed packet, update information for updating the reference  
information at the receiving side;

10 a packet transmission step of transmitting the packet



compressed in said packet compression step;

a packet receiving step of receiving an ACK packet indicating that the reference information at the receiving side has been correctly updated or a NACK packet for requesting  
15 transmission of said update information due to a header decompression error that occurred at the receiving side; and

a mode determination step of switching the operation mode of said packet compression step to a reliable mode where, after said reference information is updated, said update  
20 information is continuously added until the ACK packet is received, and to an optimistic mode where said update information is added when said reference information is updated and whenever the NACK packet is received, wherein

in said mode determination step, when said operation  
25 mode is the optimistic mode and the number of NACK packets received by a unit time  $X$  is larger than a predetermined value  $Y$ , said operation mode is switched to the reliable mode, and when said operation mode is the reliable mode and the number of ACK packets received by the unit time  $X$  is larger than a predetermined value  
30  $Z$ , said operation mode is switched to the optimistic mode.

10. The header compression method according to claim 9, wherein

in said mode determination step, a rate of change in the number of NACK packets or ACK packets received by the unit

5 time  $X$  is calculated, and the unit time  $X$  is increased when said rate of change is smaller than a predetermined value  $A$ , and decreased when said rate of change is larger than a predetermined value  $B$ .

11. A header decompression method of decompressing a header of a received packet by referring to reference information that is also included in a transmitting side, said method comprising:

5 a packet receiving step of receiving the packet with update information selectively added thereto for updating said reference information stored;

a packet decompression step, provided with the packet received in said packet receiving step, for updating said  
10 reference information by using said update information, and decompressing the header of the packet by referring to said reference information;

a packet transmission step of transmitting an ACK packet indicating that said reference information has been  
15 correctly updated or a NACK packet for requesting transmission of said update information when a header decompression error occurs in said packet decompression step;

a mode determination step of switching the operation mode of the transmitting side to a reliable mode where, after  
20 updating the reference information of the transmitting side, the

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transmitting side continuously adds said update information until  
receiving the ACK packet, and to an optimistic mode where the  
transmitting side adds said update information when the reference  
information of the transmitting side is updated and whenever  
25 receiving the NACK packet; and

a mode notification step of notifying the transmitting  
side of said operation mode selected in said mode determination  
step, wherein

in said mode determination step, the number of header  
30 decompression errors that occurred by a unit time  $X$  in said packet  
decompression step is counted and, when said operation mode is  
the optimistic mode and said number is larger than a predetermined  
value  $Y$ , said operation mode is switched to the reliable mode,  
and when said operation mode is the reliable mode and said number  
35 is smaller than a predetermined value  $Z$ , said operation mode is  
switched to the optimistic mode.

12. The header decompression method according to claim  
11, wherein

in said mode determination step, a rate of change in  
said number by the unit time  $X$  is calculated, and the unit time  
5  $X$  is increased when said rate of change is smaller than a  
predetermined value  $A$ , and decreased when said rate of change is  
larger than a predetermined value  $B$ .

13. A header compression method of compressing a header of a packet to be transmitted by referring to reference information that is also included in a receiving side, said method comprising:

5 a packet compression step of compressing the header of the packet in a specified operation mode by referring to said reference information stored, and selectively adding, to the compressed packet, update information for updating the reference information at the receiving side;

10 a packet transmission step of transmitting the packet compressed in said packet compression step;

a packet receiving step of receiving an ACK packet indicating that the reference information at the receiving side has been correctly updated or a NACK packet for requesting  
15 transmission of said update information due to a header decompression error that occurred at the receiving side;

a delay time measuring step of measuring a roundtrip delay time with respect to the receiving side by transmitting and receiving a packet to and from the receiving side; and

20 a mode determination step of switching the operation mode of said packet compression step to a reliable mode where, after the reference information to be referred to is updated, said update information is continuously added until the ACK packet is received, and to an optimistic mode where said update information  
25 is added when the reference information is updated and whenever

the NACK packet is received, wherein

in said mode determination step, said roundtrip delay time measured by a unit time  $X$  in said delay time measuring step is provided and, when said operation mode is the optimistic mode and said roundtrip delay time is smaller than a predetermined value  $Y$ , said operation mode is switched to the reliable mode, and when said operation mode is the reliable mode and said roundtrip delay time is larger than a predetermined value  $Z$ , said operation mode is switched to the optimistic mode.

14. The header compression method according to claim 13, wherein

in said mode determination step, a rate of change in said roundtrip delay time measured by the unit time  $X$  is calculated, and the unit time  $X$  is increased when said rate of change is smaller than a predetermined value  $A$ , and decreased when said rate of change is larger than a predetermined value  $B$ .

15. A header decompression method of decompressing a header of a received packet by referring to reference information that is also included in a transmitting side, said method comprising:

a packet receiving step of receiving the packet with update information selectively added thereto for updating said reference information stored;

a packet decompression step of, provided with the packet received in said packet receiving step, updating said  
10 update information by using said update information, and decompressing the header of the packet by referring to said reference information;

a packet transmission step of transmitting an ACK packet indicating that said reference information has been  
15 correctly updated or a NACK packet for requesting transmission of said update information when a header decompression error occurs in said packet decompression step;

a delay time measuring step of measuring a roundtrip delay time with respect to the transmitting side by transmitting  
20 and receiving a packet to and from the transmitting side;

a mode determination step of switching the operation mode of the transmitting side to a reliable mode where, after updating the reference information of the transmitting side, the transmitting side continuously adds said update information until  
25 receiving the ACK packet, and to an optimistic mode where the transmitting side adds said update information when the reference information of the transmitting side is updated and whenever receiving the NACK packet; and

a mode notification step of notifying the transmitting  
30 side of said operation mode selected in said mode determination step, wherein

in said mode determination step, said roundtrip delay

time measured by a unit time  $X$  in said delay time measuring step is received, and said operation mode is switched to the reliable mode when said operation mode is the optimistic mode and said roundtrip delay time is smaller than a predetermined value  $Y$ , and to the optimistic mode when said operation mode is the reliable mode and said roundtrip delay time is larger than a predetermined value  $Z$ .

16. The header decompression method according to claim 15, wherein

in said mode determination step, a rate of change in said roundtrip delay time measured by the unit time  $X$  is calculated, and the unit time  $X$  is increased when said rate of change is smaller than a predetermined value  $A$ , and decreased when said rate of change is larger than a predetermined value  $B$ .